

Compost: How Do You Know?



OBJECTIVES:

Students will:

1. conduct a scientific experiment by forming a hypothesis, collecting data, analyzing data and drawing conclusions.
2. describe how compost benefits plant growth and soil health.



STANDARDS: Science



SKILLS: Analysis, classification, description, problem solving



SETTING: Classroom and/or School garden



TIME: First Day: 40 minutes
Bi-weekly: 10 minutes (2-3 weeks)
Last Day: 30 minutes



VOCABULARY:

Compost
Data
Experiment
Hypothesis
Soil amendment
Variable

Introduction

Overview:

In this activity, students will learn about the benefits of adding compost to soil as an amendment. They will design and conduct their own experiment to test how compost affects plant growth.

Teacher Background:

Compost is a rich soil amendment produced as a byproduct of decomposition. Decomposers, such as earthworms, bacteria, insects and fungi, eat food, plant waste and each other to produce compost. Compost is often added as a soil amendment in the garden. It helps increase soil nutrients, airflow, and the ability to hold moisture and improves soil texture. Compost can be made at home or school in a compost bin or purchased from a garden center.

The steps of the scientific method used in a complete experiment are the following:

1. Start with a testable scientific question.
2. Form a hypothesis or scientific guess about how to answer the question.
3. Develop a procedure that explains how you will test your hypothesis.
4. Collect data. What did you find out?
5. Form and report your conclusion based on the data collected. Was your hypothesis correct?

In this experiment, the challenge is to identify possible advantages or disadvantages of growing seeds

with or without compost. One hypothesis could be that compost will help the plants grow bigger. The data may show that plants with compost grow taller faster. The conclusion would be that compost benefits plant growth and should be used as a soil amendment to fertilize plants.

Materials:

Students:

- “Scientific Method” handout (copy of teacher overhead)
 - “Plants in Compost” worksheet (one per student)
 - “Group Experiment” worksheet (one per group)
- Planting supplies: (one set per group)*
- Compost (from compost bin or bag from garden center)
 - Empty six-pack planter containers or six individual containers
 - Tray for planters
 - Potting soil (or soil from the yard)
 - One pack of fast growing seeds, such as beans or sunflowers
 - Measuring cup
 - Masking tape (or craft sticks)
 - Marker
 - Ruler

Teacher:

- “Scientific Method” overhead
- Rubric overhead
- Rubrics (one per student)

Preparation:

Be prepared to organize students into groups of three or four.

If you have a classroom worm compost bin, harvest the castings to use in the seed-planting experiment. See Lesson 24 for instructions on harvesting a worm bin.



RESOURCES

Discussion

Day One:

1. Ask the students what they know about compost and why people add it to their gardens. Discuss what compost is, what soil is, and how compost benefits plants.
2. Explain to the students that in this activity they will conduct an experiment to determine how compost affects the growth of plants, but first as a class they must choose a question to answer about compost.
3. Show the overhead "Scientific Method," and explain the steps. Demonstrate how the students will be using the scientific method in their experiment by coming up with a hypothesis and procedure. For example, plants will grow bigger in compost than potting soil. This will be tested by planting seeds in compost and potting soil, making observations, and collecting the results.
4. Show an overhead of the lesson rubric, and review the expectations for this lesson.
7. Place three seeds in each of the sections. Set the containers aside in a warm, sunny area. Water according to the directions on the seed packet.
8. Have students complete the top section and the first columns titled "Plant" on their "Plants in Compost" worksheets. Then, ask students to make predictions about what will happen to their seeds over the next few weeks. Which soil mix will sprout the most seeds? Which will grow the fastest? Why?
9. As a group, have them write a hypothesis on their "Group Experiment" group worksheet describing what will happen to their seeds over the next few weeks.

Procedure

Day One:

1. Divide students into small groups.
2. Pass out "Plants in Compost" and "Group Experiment" worksheets, a copy of the "Scientific Method" overhead and the planting supplies (one set for each group).
3. Have the students use masking tape (or craft sticks) to mark two sections/containers with each of the following headings: #1 Compost, #2 Compost and Soil, #3 Soil.
4. Fill the #1 sections of the six-pack planter (or two containers) with compost.
5. Measure equal parts of compost and soil. Mix the compost and soil together, and fill the #2 sections.
6. Fill the #3 sections with potting soil.

Weekly (two times a week for two to three weeks):

1. In groups, ask students to observe and note the seeds' progress. They should record the date, record the number of seeds that have sprouted, measure the height of each plant, and record their observations on the worksheet.

Wrap-Up

Last Day:

1. After two to three weeks, ask the students to examine their data and draw conclusions from it. Which section grew the tallest plant? Which one looked the healthiest? Why? If they were going to plant other seeds, what mixture would they use?

Final Assessment Idea

Ask the students to explain how compost affects plant growth. Have them write instructions for a friend to conduct the "procedure" section of their experiment.



RESOURCES

Extensions:

Have students germinate seeds in the classroom to plant in a vegetable garden at home or school.

Teacher Materials:

California State Content Standards

The standards below represent broad academic concepts. This lesson provides connections to these academic concepts through hands-on activities and exploration. This lesson is not designed for a student to master the concepts presented in the standards. Additional lessons in the classroom that build on this lesson or the standard(s) ensure that students will have the opportunity to master these concepts.

SCIENCE	CONTENT STANDARDS
Grade 4	<p>Investigation and Experimentation</p> <p>6.c. Students will formulate and justify predictions based on cause-and-effect relationships.</p> <p>6.d. Students will conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.</p> <p>6.f. Students will follow a set of written instructions for a scientific investigation.</p>
Grade 5	<p>Investigation and Experimentation</p> <p>6.b. Students will develop a testable question.</p> <p>6.c. Students will plan and conduct a simple investigation based on a student-developed question, and write instructions others can follow to carry out the procedure.</p> <p>6.d. Students will identify the dependent and controlled variables in an investigation.</p> <p>6.e. Students will identify a single independent variable in a scientific investigation and explain how this variable can be used to collect information to answer a question about the results of the experiment.</p> <p>6.f. Students will select appropriate tools (e.g., thermometers, meter sticks, balances and graduated cylinders), and make quantitative observations.</p> <p>6.g. Students will record data by using appropriate graphic representations (including charts, graphs and labeled diagrams), and make inferences based on those data.</p> <p>6.h. Students will draw conclusions from scientific evidence, and indicate whether further information is needed to support a specific conclusion.</p>





Compost: How Do You Know? Rubric

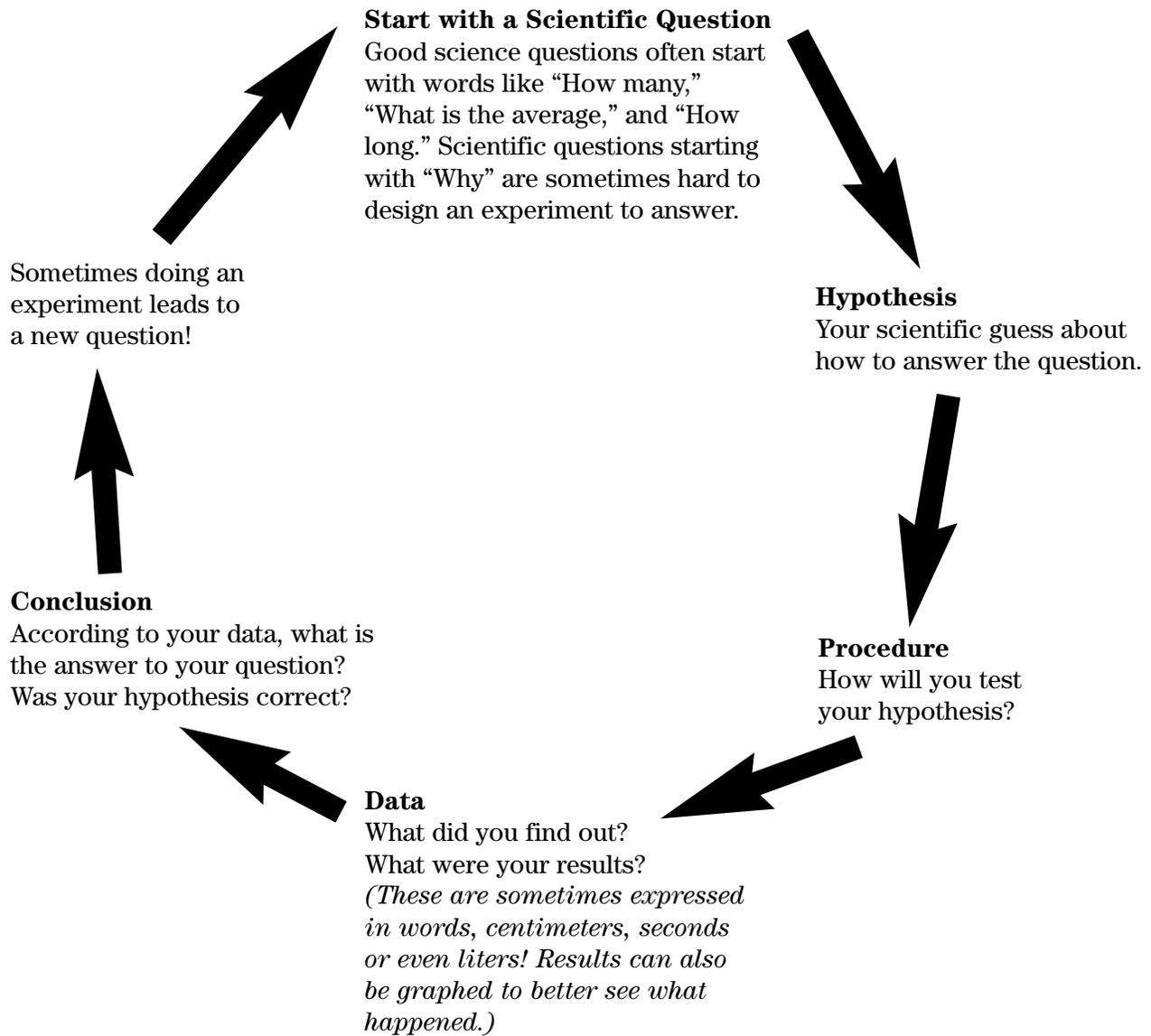
A rubric is a scoring tool that defines the criteria by which a student's work will be evaluated. This rubric is provided to assist you in setting expectations for students and assessing their performance and engagement during the lesson based on specific tasks. Ideally, a rubric is developed with the cooperation of the students. Two blank rows have been provided for you and your class to develop and add your own assessment criteria.

CATEGORY	4	3	2	1
Conduct scientific experiment that contains a scientific question, hypothesis, procedure, data collecting and conclusion	Steps to the scientific method are complete and group provides exceptional detail and organization.	Steps to the scientific method are complete.	Steps to the scientific method are incomplete or do not include sufficient details.	Steps to the scientific method are incorrect or completely missing.
Describe how compost benefits plant growth	The group accurately describes how compost benefits plant growth.	The group provides some description of how compost benefits plant growth.	The group has trouble describing how compost benefits plant growth.	The group does not do the assignment.





Scientific Method





Plants in Compost

Plant species: _____ Date planted: _____

Potting mixtures: _____

#1 _____

#2 _____

#3 _____

SPROUTING	PLANT	DATE	# OF SEEDS SPROUTED
Section #1			
Section #2			
Section #3			

GROWTH	PLANT	DATE	HEIGHT
Section #1		Week 1 _____	Week 1 _____
		Week 2 _____	Week 2 _____
		Week 3 _____	Week 3 _____
Section #2		Week 1 _____	Week 1 _____
		Week 2 _____	Week 2 _____
		Week 3 _____	Week 3 _____
Section #3		Week 1 _____	Week 1 _____
		Week 2 _____	Week 2 _____
		Week 3 _____	Week 3 _____

Name: _____ Date: _____





Student

Group Experiment

Our *scientific question* about compost is:

Our *hypothesis* is:

To *test* or answer our question (procedure) we will:

Data: What we found out is: *(Data can be expressed in words, measurements or drawings.)*

Conclusion: According to our data, our hypothesis...

Describe how compost benefits plant growth.

Name: _____ Date: _____



DEFINITIONS

Vocabulary:

Compost: the process or the end result of living organisms digesting and reducing organic material into a dark, rich, soil amendment.

Data: information gathered to find the answer to a scientific question.

Experiment: the collection of data to discover whether a variable makes a difference.

Hypothesis: a scientific guess based on observations.

Soil amendment: something added to soil to increase nutrients, improve soil texture or improve how well the soil can hold onto or drain water.

Variable: a factor that might affect the results of an experiment. To draw conclusions from an experiment, it is important to change only one variable at a time.



